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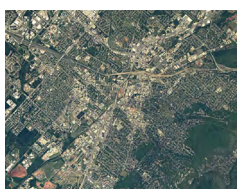
April 9, 2014

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## Rovers Ready to Roll: NASA Student Engineering Challenge Set for April 11-12

*By Rick Smith*

Of the nearly 90 high school, college and university teams registered to compete in the [NASA Human Exploration Rover Challenge](#) April 11-12, only about one in five are completely new to NASA-sponsored student racing in North Alabama.



1994-2013. Those veterans, whether they took home trophies or not, possess hard-won insight about the course challenges, and know the tricks to designing a durable, human-powered

*See [Rover Challenge](#) on [page 3](#)*

## NASA and Redstone Test Center Collaborate on Solid Rocket Motor Firing

*By Megan Davidson*

On April 3, a subscale solid rocket motor tested in a flight-like vertical orientation fired with 50,000 pounds of thrust and ignited new insights into solid rocket performance.

The hot fire, conducted at the Redstone Test Center's Test Area 5 on Redstone Arsenal, is the first vertical test for NASA's 24-inch-diameter, two-segment solid rocket motor test article. Engineers from



*A subscale solid rocket motor during a vertical test firing April 3 at the Redstone Test Center's Test Area 5 on Redstone Arsenal. (Redstone Test Center)*

*See [Rocket Motor Firing](#) on [page 4](#)*

# NASA's Marshall Space Flight Center, Aerospace Industry Honored by Alabama Legislature

By Kenneth Kesner

NASA's Marshall Space Flight Center was honored by the Alabama Legislature April 3 during NASA Alabama Aerospace Day 2014 events at the state Capitol in Montgomery. Lawmakers and state officials met with Marshall Center Director Patrick Scheuermann, and resolutions in the state House and Senate recognized the center's critical role in future space exploration, in the nation's space history and in the state's economy and cultural life.

A number of NASA exhibits and activities conveyed a vivid picture of work now underway on the Space Launch System -- the most powerful rocket in history and the vehicle that will take astronauts to Mars; on science missions aboard the International Space Station; and on additive manufacturing and 3-D printing technologies helping develop aerospace technology faster and at lower costs.

"Together We Make Bold Things Happen" was the theme for NASA Alabama Aerospace Day, and Marshall representatives visited a number of schools and nonprofit organizations in the Montgomery area to talk with students about robotics, technology, careers in aerospace and the importance of science, technology, engineering and mathematics education.

On April 2, the Marshall Center partnered with the



*Astronaut Stephanie Wilson shakes hands with Gov. Robert Bentley during NASA Alabama Aerospace Day 2014 on April 3 at the Capitol in Montgomery. Marshall Center Director Patrick Scheuermann, Wilson and others met with the governor, as well as with Lt. Gov. Kay Ivey and House Speaker Mike Hubbard. Wilson also spoke on the floors of the Alabama House and Senate, where resolutions honoring NASA and Marshall were presented. (NASA/MSFC/Emmett Given)*

Aerospace States Association and the Huntsville-Madison County Chamber of Commerce for a roundtable discussion at the State House on "Economics and Education: The Impact of the Aerospace Industry in the State of Alabama."

"Our partners in industry and education have always been important to NASA and Marshall Space Flight Center," Scheuermann said. "Partnerships are critical to developing NASA's Commercial Crew Program and continuing support of the International Space Station with its increasing number of science missions; to placing the James Webb Space Telescope in orbit, allowing us to look deeper into the universe than ever before; and to NASA's Space Launch System.

"Montgomery is an important partner, too, representing the people of Alabama," Scheuermann said. "It was exciting to talk with lawmakers and officials about opportunities to leverage aerospace resources already in the state, and about the benefits from the resulting jobs and synergies in information technology, materials, manufacturing, education and other areas."

*Kesner, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.*



*Marshall Center Director Patrick Scheuermann, right, talks with Alabama Gov. Robert Bentley as astronaut Stephanie Wilson signs a photo for the governor during NASA Alabama Aerospace Day 2014 on April 3 at the Capitol in Montgomery. Wilson also spoke on the floors of the Alabama House and Senate, where resolutions honoring NASA and the center were presented. (NASA/MSFC/Emmett Given)*



vehicle.

Regardless, said NASA scientist Dennis Gallagher, “this year, everybody’s a rookie.”

Gallagher is a space physicist and supervisor in Marshall’s Science & Exploration Research Office. He’s also one of the principal planners of the event, which is organized by Marshall’s Academic Affairs Office.

What has made rookies of this year’s entire crop of racers? It’s not just the semantic and practical transition from “moonbuggies” to “rovers,” Gallagher said, nor the updated obstacle course designed to make even the savviest of past racers sweat.

It’s the central design challenge of the 2014 event, he said -- it’s the wheels.

For 20 years, the Great Moonbuggy Race challenged students to conceive and build their own lightweight vehicles, powered by one male and one female driver. Those basic rules still apply -- but teams now must toss out the bicycle, motocross and off-road tires they’ve typically used in the past to speed around the course at the [U.S. Space & Rocket Center](#).

The wheels -- the core element of the vehicle -- now must be each team’s own invention, along with the rest of their rover. “Tracks, treads, skids, belts, rails, rollers,” Gallagher suggested. “Whatever mobility components they devise to provide surface contact and motion across the course are fair game -- with one exception. They can no longer incorporate inflated (or uninflated) pneumatic tires.”

That should make for a truly inventive fleet of student-built rovers, said Dr. Frank Six, the Marshall academic affairs officer who co-designed both race courses.

“Our racers are overcoming the same types of design problems NASA engineers grapple with on real vehicle development and exploration missions every day,” Six said. “Where they’re going is instrumental to the solutions they’ll come up with.”

This year, with the Red Planet as the primary inspiration for the unique obstacles littering the course, teams must factor in ideal wheel diameter and traction to successfully navigate a variety of Mars-like surfaces -- from large boulders, small pebbles and loose sand, to rock that may be smooth, cracked or crumbling beneath

them.

Marshall education specialist Diedra Williams, who leads planning for the event, said team reactions to the new requirement have run the gamut from excitement to mild panic, but she’s quick to reassure them they do have the right stuff to execute a winning rover design.

“It’s a more complex challenge, but it’s also a more authentic engineering experience than we’ve ever tasked them with before,” she said. “Now they’re real engineers!”

Tom Hancock, a member of the Rover Challenge planning committee and past chair of the [American Institute of Aeronautics and Astronautics’](#) Greater Huntsville section, agreed. “The wheel challenge raises the level of sophistication of the event to a whole new plateau,” he said. “It was about pure, gut survival before. Now it’s a matter of refined technology performance and a heightened level of team ingenuity.”

Racers struggling with the original wheel design will get to tackle the course even if they show up without a working wheel solution. They won’t qualify for a top trophy, of course -- but no one will rebuke them for a design failure.

“Failure is part of the engineering process,” Hancock said. “Teams will still get to try out the new course, network with teams from around the world and better prepare themselves for next year.”

“Do the best you can,” Gallagher echoed. “The only failure is not to try again.”

### Watch live -- in person or online!

The NASA Human Exploration Rover Challenge will begin at 7:30 a.m. each day of competition. Watch the [live streaming broadcast on UStream](#) April 11-12, and [receive real-time race updates via Twitter](#). North Alabama residents are encouraged to come watch in person -- admission to watch the race is free with any paid ticket to visit the U.S. Space & Rocket Center. The awards ceremony will begin at 5 p.m. April 12, and will be streamed live on UStream. For more information, [visit the official website](#).

*Smith, an ASRC Federal / Analytical Services employee, supports the Office of Strategic Analysis & Communications.*

## Rocket Motor Firing *Continued from page 1*

NASA's Marshall Space Flight Center led the test effort, which hot fired the 20-foot-long test article for 20 seconds, reaching temperatures of 5,000 degrees.

"Our Team Redstone collaboration allowed us to test a subscale booster of this size in a vertical position for the first time," said Scott Ringel, a Marshall Center engineer and design lead for the test. "The vertical test position gives us better insight into how solid rocket booster technology performs during ignition, launch and liftoff."

One of the test objectives is to look for evidence of "slag" -- a pool of chemical components that can build up in the bottom of motors. Marshall engineers want to understand the effects of slag on the internal insulation material. Slag is a result of solid rocket propellant combustion, and NASA engineers have studied its effects since the early days of the space shuttle booster flights.

Marshall engineers also will use data collected from the test to study insulation, propellant and nozzle performance, which will improve the modeling techniques used on the design of large boosters. A team from NASA's Kennedy Space Center worked with Marshall engineers to install samples beneath the motor to test candidate materials for the Space Launch System (SLS) booster aft skirt umbilical, a feed line that delivers gaseous nitrogen to keep temperatures at a determined rate before a launch.

All this data is valuable to NASA's Engineering and Safety Center (NESC), which is one of the sponsors of the test. Test analysis will be added to the engineering database on boosters to help ensure the safety and mission success for the many launch vehicles across government and commercial rockets powered by solid rocket boosters.

"This test is a low-cost, reliable way not only to reduce any risks associated with boosters, but also to provide our younger engineers with an excellent opportunity to get their hands dirty," said Ringel. "They are involved in every part of the process -- designing, analyzing, building, disassembling the motors and studying the data. You really can't get better experience as an early career engineer than learning directly from hardware."

Previous similar tests were conducted in the horizontal position in Marshall Center's test area, but there was no capability to test in the vertical position. Now, through a Team Redstone partnership, Marshall engineers can complete a test affordably at the nearby Redstone Test Center. This allows engineers to compare data from the numerous horizontal solid rocket motor firings to new data from the vertical firing.

"We are proud to provide test and evaluation support to our partners at Marshall," said Chuck Gibbs, director for Redstone Test Center's Missiles and Sensors Test Directorate. "Tests like this are a good example of the working relationship we have here on Team Redstone, to not only provide support to the warfighter in the field, but to our nation's space program as well."

The subscale motor test is a collaborative effort between the Marshall Center; the U.S. Army Redstone Test Center; the SLS Program; NASA's Engineering and Safety Center; Jacobs Technology Inc. of Huntsville; and ATK of Brigham City, Utah.

This kind of testing may be beneficial for future launch vehicles, including NASA's SLS. Two five-segment solid rocket motors -- the world's largest at 154 feet long and 12 feet in diameter -- will be used in the first two 70-metric-ton capability flights of SLS.

To watch a video of the solid rocket motor firing, click [here](#).

*Davidson, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.*



# Marshall Center Launches 'I Love Earth' Social Media Image Campaign

By Janet Anderson and Tracy McMahan

April 22 is Earth Day and in celebration, NASA's Marshall Space Flight Center social media team is hosting a month-long campaign, "I Love Earth." The campaign features images of Earth taken from space with an emphasis on images taken from the International Space Station.

Followers on Marshall's social accounts are offered the opportunity to comment and let us know what "where on Earth are you." Based on your comments, the social team will locate a satellite image from that location and post it tagging the person who requested that location. So far, images have been posted from Turkey, Saudi Arabia, Italy, the Marshall Islands, and the United Kingdom.

We invite you to participate in the campaign and share your favorite image of Earth from space. Follow Marshall news and interact with the NASA Marshall community on Facebook, Twitter, Flickr and Instagram.

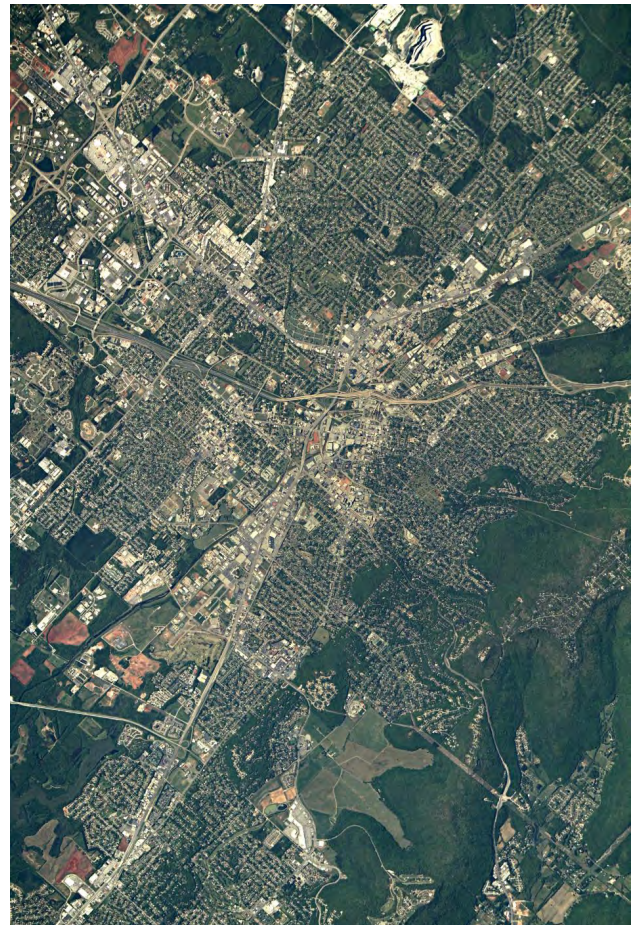
Facebook: <http://www.facebook.com/nasamarshallcenter>

Twitter: [http://twitter.com/NASA\\_Marshall](http://twitter.com/NASA_Marshall)

Flickr: <http://www.flickr.com/photos/28634332@N05/sets>

Instagram: [http://instagram.com/nasa\\_marshall](http://instagram.com/nasa_marshall)

*Anderson and McMahan are public affairs officers in the Office of Strategic Analysis & Communications.*



WHERE ON EARTH ARE YOU? We're looking down at Huntsville -- the Rocket City itself -- as photographed by the International Space Station SERVIR Environmental Research and Visualization System (ISERV) camera. ISERV, designed and built in Huntsville, captures images of Earth for disaster monitoring and assessment, environmental decision-making and other research activities. (NASA/ISERV)

## SLS Core Stage Model 'Sounds' Off for Testing

A 5-percent scale model of the Space Launch System (SLS) core stage fires up for another round of acoustic testing at NASA's Marshall Space Flight Center. SLS, NASA's new rocket, will be the largest, most powerful rocket ever built for deep space missions. The SLS core stage, towering more than 200 feet tall with a diameter of 27.6 feet, will store cryogenic liquid hydrogen and liquid oxygen that will feed the vehicle's RS-25 engines. The acoustic tests, which began in January, will show how powerful noise from the engines and boosters can impact the rocket and crew, especially at liftoff. Data from the tests will help verify the rocket's design and help develop an effective suppression system to stifle the sound. The current test series, which began March 20, will be used to determine the noise reduction capabilities of the water suppression system at NASA's Stennis Space Center. The system will be used for core stage "green run" testing, which ensures all stage and engine parts have been exposed to flight-like environments prior to use on a mission. (NASA/MSFC/David Olive)





# NASA-USAID Program Highlights Youthful Enthusiasm for Earth Stewardship and Research

By Dauna Coulter

Susan Malaso is a prime example of the caliber of person selected for participation in a global environmental fellowship program called My Community Our Earth (MyCOE/SERVIR). Malaso used the research skills and knowledge of remote-sensing data she gained in the program to map the risks that frost poses to agricultural productivity in her native Kenya.

Malaso and 13 other fellows from Africa, Southeast Asia and the Himalayas converged on Washington on April 3 to showcase the results of their work. NASA, the U.S. Agency for International Development (USAID), and the Association of American Geographers are hosting the fellows who are engaged in geospatial technology-based environmental research. This event draws nearly 8,000 attendees from over 60 countries.

The MyCOE/SERVIR partnership supports long-term training by young, emerging scholars and practitioners to use geography and geographic technology for addressing climate change issues across developing regions of the world. The program is designed to provide mentorship, networking, and the professional development necessary to transform the innovators into scholars who have the skills to connect their science results to the public and decision makers.

Over the past two years the MyCOE/SERVIR program



*Susan Malaso, a student at Kenyatta University in Kenya, speaks about her project during presentations as part of the MyCOE/SERVIR Global Fellowship Program at NASA Headquarters on April 3. Her project demonstrated the role that satellite imagery technologies can play in frost risk mapping to aid farmers in selecting the right planting times and crops. (NASA/Joel Kowsky)*

has carried out student-led projects that highlight how youth around the world are using remote sensing, Geographic Information Systems, and geospatial data to address climate change issues in their regions.

The fellows hail from 10 countries and bring together four regional rounds of 10-month fellowship terms in East Africa, the Himalayas, West Africa and Southeast Asia. They are using Earth observation data and geospatial technology to research areas that include remote sensing of frost to aid agriculture, assessing glacier health to understand climate change, studying the potential of floating gardens to save a natural ecosystem, and researching impacts of illegal logging in a rainforest.

Born and raised within the Masai community at Sintakara Village, Narok County, in Kenya's Rift Valley Province, Malaso has faced many challenges, such as overcoming the common Masai norm of a patriarchal society with defined roles for men and women.

“Unlike the boys, who would go tending to cattle the whole day during holidays, the girls had to gather firewood in the bushes, wash clothes, go to the market over 3 miles away, help their mothers in farming and cooking, and look after the younger children. We also



*Joyeeta Poddar, second from right, a student at the Birla Institute of Technology in India, speaks about her project during presentations as part of the MyCOE/SERVIR Global Fellowship Program at NASA Headquarters. Her project used satellite imagery and advanced digital processing techniques to assess glacier health as a response to climate change in the Western Himalayas. (NASA/Joel Kowsky)*

*See NASA-USAID Youth on page 7*

# Marshall Team to Observe and Take Questions on Lunar Eclipse

Spring is here and ready to capture the world's attention with a total lunar eclipse. The eclipse will occur early on the morning of April 15 at approximately 1 a.m. If you have questions about the eclipse, this will be your chance to ask experts at NASA's Marshall Space Flight Center!

Throughout human culture lunar eclipses have been viewed with awe and sometimes fear. A lunar eclipse happens when Earth casts a shadow that blocks sunlight which normally reflects off of the moon. Of the three types of lunar eclipses -- total, partial and penumbral, only during a total lunar eclipse does Earth's shadow completely cover the moon. A total lunar eclipse can only happen when the sun, Earth and moon are perfectly aligned.

During a lunar eclipse, as Earth's shadow crosses the moon, the shadow will appear dark until it has completely covered the moon. During the time of the total eclipse, the moon will often become reddish due to red and orange light being scattered by the atmosphere. This eerie but harmless effect has earned the tongue-in-cheek nickname "blood moon."

Marshall will host two events for NASA moon experts to answer your questions. On April 14 from 1-2 p.m., NASA planetary scientist [Renee Weber](#) will take your questions



*Total lunar eclipse captured Jan. 20-21, 2000. (Mr. Eclipse/Fred Espenak)*

via a [Reddit AMA](#) (Ask Me Anything). The Reddit page will be live on April 14 at approximately 12:45 p.m., and the link will be promoted on [this page](#). Later NASA astronomer [Mitzi Adams](#) and astrophysicist Alphonse Sterling will take your question via a live web chat. The chat will begin at midnight April 14 and continue through the end of the eclipse (approximately 4 a.m. April 15). The chat module will go live on [this page](#) at approximately 11:45 p.m. April 14.

A live Ustream view of the lunar eclipse will be streamed on [this page](#) on the night of the event, courtesy of the [Marshall Center Ustream feed](#).

## NASA-USAID Youth *Continued from [page 6](#)*

had to fetch water over long distances. The availability of water became a problem when the river became seasonal and finally dried up permanently. Spending up to five hours after school to fetch water from a shared spring a few miles away was the order of the day."

Competing with the boys in school was tough, Malaso says, and many Masai girls gave up. She attended primary and secondary school in Kenya, and her excellent grades qualified her for acceptance at Kenyatta University in Kenya. Apart from the university course work, she did a practicum at the Regional Centre for Mapping of Resources for Development (RCMRD) in Nairobi that introduced her to geographic information systems and to satellite imagery technologies such as remote sensing. RCMRD is the host organization in Africa for the NASA/USAID SERVIR project. SERVIR translates satellite observations into useful information about land cover and land use, climate, water, agriculture, natural disasters and more to help developing nations monitor, forecast

and respond to environmental changes.

During her time at SERVIR-Africa, Malaso learned of MyCOE/SERVIR and applied to the program. She calls the approval of her proposal and her selection as a MyCOE/SERVIR fellow "a breakthrough." Her resulting project, called Application of Geographic Information Systems and Remote Sensing to Frost Risk Mapping for Improving Agricultural Productivity, won an award from Esri, an international supplier of geographic information system software, Web geographic information systems and geodatabase management applications. According to Malaso, the MyCOE/SERVIR program helped her develop research skills, gain knowledge and develop a tool to help her community deal with such challenges in the future.

*Coulter, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.*